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## Knowledge and attitude of dental professionals towards shortened dental arch concept: A cross sectional study in Saudi Arabia

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**ABSTRACT**

**Introduction:** This survey aims to investigate knowledge and attitudes among general dental practitioners (GP) and specialists/consultants toward the shortened dental arch (SDA) concept in Saudi Arabia. **Method:** A web-based survey was under taken in general dental practitioners (GP) and specialists/consultants in Saudi Arabia. A structured, close ended and self-administered questionnaire consisting of demographic information and twenty items on the SDA concept was administered to the study participants. The questionnaire enquired about study participants' perspectives on the awareness, indication, contraindication, function, aesthetics and comfort of SDA therapy. It also probed about the risks related to SDA treatment (temporomandibular joint problems, tooth movement, speech). All the collected data were analyzed using the Chi-square test. **Results:** Most dental professionals were some familiarities with the SDA concept. Awareness of SDA concept differed significantly between male and female study participants (17.70%, 38.10%, 44.20% versus 13%, 53.10%, 33.90%;  $p=0.008$ ). However, no such difference was observed between GPs and specialists/consultants (11.30%, 47.90%, 41.80% versus 28.40%, 37.60%, 33.90%;  $p=0.089$ ). Almost 32.2% and 34.8% were unsure about the dental and oral comforts after SDA treatment. Most agreed that SDA provides an overall favorable periodontal prognosis (31.7%), useful in limited restorative treatment options (33.8%). Most participants agreed that the SDA does not lead to reduction in occlusal vertical dimension (30%) and TMJ problems (32.4%), allows keeping natural teeth for longer (32.66%) and reduces the risk of overtreatment (31.2%). **Conclusion:** Dental professionals showed insufficient knowledge and attitude towards SDA concept with gender and designation differences.

**Keywords:** Attitude, knowledge, general dentist, specialist, consultant

## 1. INTRODUCTION

Shortened dental arch refers to the dentition having a minimum of twenty interdental units that is considered suboptimal (Witter et al., 1997). However, it may be tolerated by a patient with healthy stomatognathic function. Four occluding units may be adequate to achieve healthy occlusion. As per the World Health Organization, functional dentition consists of a minimum of 21 healthy and functioning teeth (Hobdell et al., 2003). It is possible to simplify treatment using a shorter dental arch (Gupta et al., 2016). Due to its distinct approach from traditional dentistry, the notion is contentious. It was argued that SDA might lead to temporomandibular disorders and tooth migration, as well as masticatory problems and reduced quality of life for patients (Gupta et al., 2016).

Different prosthetic equipment is available to replace lost teeth. However, their selection is determined by a variety of variables. Instead of complicated restoration treatments, most patients prefer to preserve their remaining teeth with a functionally sound occlusion and healthy periodontium. For example, anterior and premolar teeth should be in excellent occlusion and there should be no parafunctional habits or mandibular dysfunction before considering SDA as a therapy option. On the other hand, some patients refuse to believe that lost teeth cannot be replaced. Many risk factors came with the absence of posterior occluding pairs that account for TMD and wearing teeth (Mc Lister et al., 2018).

Recent studies on dentists' opinions on the SDA reported acceptable chewing function, oral comfort and aesthetic needs (Faharina et al., 2017; Suleman et al., 2020). Nearly 75% of dentists applying SDA to their patients reported huge oral comfort and preferred choice for their patients (Kasim et al., 2018). Indian prosthodontists observed a good attitude toward the SDA concept (Kumar and George, 2012). Moreover, SDA therapy is well known to dentists in Malaysia without wide application.

A recent study in Saudi Arabia found that nearly 43.7% of dentists knew about the SDA. However, only 2.6% applied this concept in their routine clinical practice. Despite a few studies on SDA in Saudi Arabia, it is unclear about the knowledge and attitude trend toward using SDA among the current dental professionals. Moreover, it is essential to explore the status of SDA therapy among dental professionals based on gender and professional designation. Hence this study evaluated the knowledge and attitude of GP and specialists/consultants toward the SDA concept in Saudi Arabia.

## 2. MATERIALS AND METHODS

### **Ethical approval**

The study proposal was submitted to the research and innovation center of Riyadh Elm University and ethical clearance was obtained from the institutional review board (FRP/2021/365/561/536). All the study participants provided informed consent by agreeing to participate.

### **Study design**

It was a descriptive cross-sectional study carried out among general dentists, specialists and consultants practicing in Saudi Arabia. Data collection was carried out from October to December 2021.

### **Study sample**

The study utilized a convenience sampling technique to recruit subjects. Saudi dental professionals (GPs and specialists/consultants) active on social media networks were recruited in this study. Participation was voluntary and anonymous. Dental students and dental auxiliaries were not considered in the study. A minimum required sample size of 376 was decided based on the acceptable margin of error (5%), the confidence level of (95%) and the total licensed dental practitioners (n=16887). However, to enhance study power, a total of 423 participants were included.

### **Study instrument**

A structured close-ended and self-administered questionnaire was utilized in this study. The questionnaire comprised of demographic information (gender, age, work sector, work experience, designation and city of work) and twenty items on the awareness and attitude of participants towards SDA. The questionnaire items were prepared from the review of similar studies conducted world wide (Kasim et al., 2018; Abu-Awwad et al., 2019; Suleman et al., 2020). The responses to knowledge items of SDA were recorded based on the three-point Likert scale (highly aware, some what aware and not at all aware), while other item's responses were based on five points Likert scale (strongly agree, agree, not sure, disagree and strongly disagree).

### Instrument validity and reliability

The face validity of the instrument was established by taking the expert opinion of a restorative dentistry consultant. The reliability was assessed by twice recording of responses to the questionnaire items from twenty participants in a week apart. A Cronbach's coefficient alpha of 0.71 was observed, indicating good agreement.

### Questionnaire administration

An electronic version of the study instrument was prepared using google forms and the link was shared in the prominent social media groups of Saudi dental professionals. The invitation message included a description of the research's goal, the lead investigator's contact information and a live link to the survey. It took 8-10 minutes for each participant to complete the questionnaire.

### Statistical Analysis

Data analysis was performed using SPSS (version 25, Armonk, NY: USA), where descriptive statistics of frequency distribution and percentages were computed for all the categorical variables. The questionnaire item responses were compared across different gender and specialization using the Chi-square test. The value of significance was kept under 0.05 for all the statistical tests.

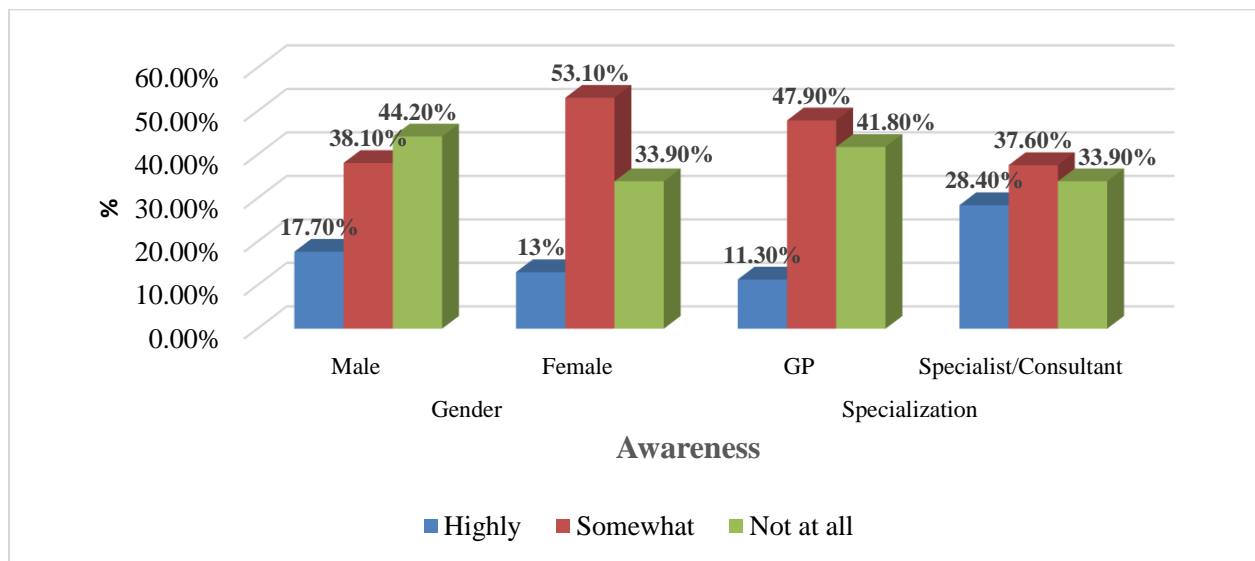
## 3. RESULTS

The current study explored the dental professional's awareness and attitude toward SDA in Saudi Arabia. A total of 423 dental professionals answered the survey questionnaire, in which most participants were male (54.6%) and aged between 26-30 years. Most of them worked in the private sector (65%), with less than ten years of experience (74.2%). More than half (62.9%) of the participants were general dental practitioners mainly practicing in Riyadh (76.6%). The demographic and practice variables of the study participants are shown in (Table 1).

**Table 1** Demographic and practice variables (N=423)

Variables		N (%)
Gender	Male	231(54.6%)
	Female	192(45.4%)
Age	20-25	114(27%)
	26-30	152(35.9%)
	30-40	62(14.7%)
	41-50	48(11.3%)
	50 above	47(11.1%)
Work sector	Private	275(65%)
	Government	148(35%)
Work Experience	Less than 10 years	314(74.2%)
	More than 10 years	109(25.8%)
Designation	General practitioner	266(62.9%)
	Specialist/ Consultant	157(37.1%)
City of Work	Riyadh	322(76.6%)
	Jeddah	101(23.3%)

Study participants' knowledge on SDA concept was assessed using a threepoint Likert scale (high, somewhat and not at all) (Figure 1). Male versus female awareness of SDA concept showed a statistically significant difference (17.70%, 38.10%, 44.20% versus 13%, 53.10%, 33.90%;  $p=0.008$ ). However, no such significant difference was noted between GP and specialist/consultants (11.30%, 47.90%, 41.80% versus 28.40%, 37.60%, 33.90%;  $p=0.089$ ). Most participants were some what familiars with the SDA concept.



**Figure 1** Awareness SDA concept among different gender and specialization

Most of the study participants were not sure about the application of SDA in occlusion with one standing tooth (31%), the SDA concept consists of 10 pairs of occluding teeth (31.2%), SDA preferred for patients with periodontal problems and dental decay mainly affecting molars (34.5%) and absolute contraindications for applying SDA (30.3%). Moreover, 31% of the study participants were not sure about the SDA aggravating periodontitis in low marginal bone levels (31%) and causing speech problems (31.2%). Similarly, most subjects were unsure of the shortening of the dental arch (33.6%) and unsupported molars could have TMJ problems (28.4%). When enquired about patient satisfaction with SDA treatment approach, 32.2% and 34.8% were unsure about dental and oral comforts. On the contrary, most participants agreed that SDA provides an overall favorable periodontal prognosis (31.7%), which can be proposed to patients with limited restorative treatment options (33.8%). Moreover, a large percentage of study participants agreed that SDA does not result in loss of the vertical dimension of occlusion (30%) and TMJ problems (32.4%). Instead, SDA allows patients to keep their natural teeth for longer (32.66%) and reduces the risk of overtreatment (31.2%) (Table 2).

**Table 2** Knowledge and attitude of study participants towards SDA items (N=423)

SDA Items	Description	SA N (%)	A N (%)	NS N (%)	D N (%)	SD N (%)
1	SDA concept can be applied in patients with good dental occlusion with 1 standing tooth?	64 (15.1)	102 (24.1)	131 (31)	58 (13.7)	68 (16.1)
2	Does the SDA concept consist of 10 pairs of occluding teeth, from the first incisors to second premolars?	61 (14.4)	127 (30)	132 (31.2)	55 (13)	48 (11.3)
3	SDA concept can be proposed to patients with caries or periodontal disease, mainly affecting the molar dentition	58 (13.7)	129 (30.5)	146 (34.5)	53 (12.5)	37 (8.7)
4	SDA concept can be proposed to patients with an overall favourable periodontal prognosis	54 (12.8)	134 (31.7)	133 (31.4)	47 (11.1)	55 (13)
5	SDA concept can be proposed to patients with limited restorative treatment options	61 (14.4)	143 (33.8)	119 (28.1)	57 (13.5)	43 (10.2)
6	There is no absolute contraindication for applying SDA	47 (11.1)	81 (19.1)	128 (30.3)	66 (15.6)	101 (23.9)

	concept in patients					
7	An intact dental arch from the first incisors to second premolars is aesthetically acceptable for a patient	54 (12.8)	158 (37.4)	117 (27.7)	53 (12.5)	41 (9.7)
8	A minimum of ten occluding pairs of teeth is necessary for adequate oral function	66 (15.6)	147 (34.8)	120 (28.4)	50 (11.8)	40 (9.5)
9	The preservation of anterior and premolar portions of the dental arches should be the primary focus of treatment planning for older individuals.	56 (13.2)	144 (34)	122 (28.8)	52 (12.3)	49 (11.6)
10	SDA does not worsen periodontitis in individuals with low amounts of marginal bone.	53 (12.5)	118 (27.9)	131 (31)	71 (16.8)	50 (11.8)
11	SDA does not result in vertical dimension loss of occlusion	56 (13.2)	127 (30)	126 (29.8)	62 (14.7)	52 (12.3)
12	SDA does not result in TMJ problems	68 (16.1)	137 (32.4)	125 (29.6)	48 (11.3)	45 (10.6)
13	SDA does not produce speech problems	70 (16.5)	132 (31.2)	132 (31.2)	42 (9.9)	47 (11.1)
14	SDA permits patients to maintain their natural teeth for longer	75 (17.7)	138 (32.6)	115 (27.2)	47 (11.1)	48 (11.3)
15	SDA decreases the risk of overtreatment	80 (18.9)	132 (31.2)	122 (28.8)	43 (10.2)	46 (10.9)
16	Patients with shortening of their dental arch	54 (12.8)	131 (31)	142 (33.6)	51 (12.1)	45 (10.6)
17	Patients without the molar support end up in TMJ issues	63 (14.9)	97 (22.9)	120 (28.4)	85 (20.1)	58 (13.7)
18	Patients with an SDA are pleased with their dental appearance	66 (15.6)	127 (30)	136 (32.2)	51 (12.1)	43 (10.2)
19	Patients with an SDA report satisfying oral comfort.	74 (17.5)	116 (27.4)	147 (34.8)	42 (9.9)	44 (10.4)

SA=Strongly Agree, A=Agree, NS=Not sure, D=Disagree, SD=Strongly Disagree

Male research participants indicated higher agreement on the lack of absolute contra indications to applying the SDA concept to patients than female participants. When responses were compared between males and females they differed significantly ( $p=0.02$ ). Similarly, females indicated higher agreement than males regarding the shortening dental arch with a significant difference in responses ( $p=0.043$ ). However, gender differences were not observed regarding other items of SDA (Table 3).

**Table 3** Knowledge and attitude of SDA among different genders (N=423)

SDA Items	Male					Female					P
	SA %	A %	NS %	D %	SD %	SA %	A %	NS %	D %	SD %	
1	16	21.70	32.90	14.30	15.10	14.10	27.10	28.70	13	17.20	0.635
2	14.30	29.90	32	11.70	12.10	14.40	30	31.20	13	11.30	0.899
3	13.90	25.50	36.40	13.90	10.40	13.50	36.50	32.30	10.90	6.80	0.142
4	13	30	35.10	10.80	11.10	12.50	33.90	27.10	11.50	15.10	0.419
5	14.30	32.50	29	15.60	8.60	14.60	35.40	27.10	10.90	12	0.52

6	12.60	22.10	31.20	16.50	17.70	9.40	15.60	29.20	14.60	31.30	0.02
7	13.40	39	29	10.80	8.20	12	35.40	26.60	14.60	11.50	0.559
8	16	32.90	27.30	13	10.80	15.10	37	30	10.40	7.80	0.669
9	12.60	33.30	29	13.40	11.70	14.10	34.90	28.60	10.90	11.50	0.94
10	10.40	23.80	33.80	19	12.90	15.10	32.80	27.60	14.10	10.40	0.08
11	13.40	28.60	29.40	15.60	12.90	13	31.80	30.20	13.50	11.50	0.926
12	15.60	31.60	32	8.20	12.60	16.70	33.30	26.60	15.10	8.30	0.118
13	14.30	31.60	32	9.50	12.60	19.30	30.70	30.20	10.40	9.40	0.6
14	17.70	29	31.20	9.90	12.10	17.70	36.90	22.40	12.50	10.40	0.207
15	19	27.30	32.90	9.10	11.70	18.80	35.90	23.90	11.50	9.90	0.176
16	10.40	28.10	33.80	15.60	12.10	15.60	34.40	33.30	7.80	8.90	0.043
17	12.60	25.50	28.60	17.70	15.60	17.70	19.80	28.10	22.90	11.50	0.193
18	12.10	29.40	35.50	11.30	11.70	19.80	30.70	28.10	13	8.30	0.125
19	17.30	24.20	38.90	7.40	12.10	17.70	31.30	29.70	13	8.30	0.054

SA=Strongly Agree, A=Agree, NS=Not sure, D=Disagree, SD=Strongly Disagree

**Table 4** Knowledge and attitude of SDA based on the designation of dental professionals (N=423)

SDA Items	General practitioners					Specialist/consultants					P
	SA %	A %	NS %	D %	SD %	SA %	A %	NS %	D %	SD %	
1	12.70	25.80	32.20	13.10	16.20	22	19.30	27.50	15.60	15.60	0.136
2	10.80	31.50	33.40	13.10	11.10	24.80	25.70	24.80	12.80	11.90	0.008
3	9.60	32.50	36.60	12.40	8.90	25.70	24.80	28.40	12.80	8.30	0.001
4	9.90	32.50	33.10	10.80	12.70	21.10	26.60	26.60	11.90	13.80	0.034
5	11.50	36.60	28.90	13.10	9.90	22.90	25.70	25.70	14.70	11	0.029
6	10.80	19.40	30.60	15.60	23.60	11.90	18.30	29.40	15.60	24.80	0.994
7	9.60	38.50	30.30	11.50	10.20	22	33.90	20.20	15.60	8.30	0.005
8	14	35.40	29.30	11.50	9.90	20.20	33	25.70	12.80	8.30	0.587
9	11.10	35.40	29.30	11.70	12.40	19.30	30.30	27.50	13.70	9.20	0.221
10	11.40	22.80	33.80	18	12.90	16.10	32.80	26.60	15.10	11.40	0.020
11	12.40	29.60	28.40	16.60	12.90	12	30.80	31.20	12.50	11.50	0.056
12	16.60	30.60	31	9.20	12.60	15.70	34.30	27.60	15.10	9.30	0.046
13	13.30	32.60	31	10.50	12.60	18.30	31.70	31.20	9.40	9.40	0.067
14	18.70	28	30.20	8.90	13.10	18.70	37.90	23.40	13.50	10.40	0.207
15	18	26.30	33.90	8.10	12.70	17.80	36.90	22.90	12.50	9.90	0.765
16	11.40	27.10	34.80	14.60	12.10	16.60	33.40	32.30	8.80	8.90	0.034
17	11.60	26.50	27.60	18.70	15.60	18.70	18.80	27.10	23.90	11.50	0.931
18	12.10	29.40	35.50	11.30	11.70	19.80	30.70	28.10	13	8.30	0.156
19	17.30	24.20	38.90	7.40	12.10	17.70	31.30	29.70	13	8.30	0.876

SA=Strongly Agree, A=Agree, NS=Not sure, D=Disagree, SD=Strongly Disagree

In general, specialists/consultants than general practitioners showed higher agreement with the SDA regarding ten pairs of occluding teeth and the proposal of this concept to patients with caries and periodontal disease and the overall favorable periodontal prognosis, in cases were limited patient options and aesthetic acceptability. Similar difference was observed when the responses were compared between general practitioners and specialists/consultants ( $p < 0.05$ ). Similarly, from the first central incisors to the second premolar, a continuous dental arch is aesthetically acceptable, SDA does not exacerbate periodontitis in low levels of marginal bone and it does not cause TMJ issues and SDA is applicable in shortening of the dental arch were found to be in higher agreement in specialists and consultants than general dental practitioners ( $p < 0.05$ ).



#### 4. DISCUSSION

Our study presents a comparative assessment of the SDA concept between GPs and specialists/consultants in Saudi Arabia. Adequate responses were obtained through electronic surveys. Most of the respondents had less than ten years of experience. In around fifty percent of SDA related questions, a considerable proportion of respondents lacked confidence in their replies. Consequently, most of the dental professionals in this survey were uncertain about SDA.

Only 31.30% of the participants in our survey were familiar with the SDA idea. Females and specialists/consultants had greater awareness of SDA therapy. This result is in line with past research from the Nigeria (Arigbede et al., 2009) and India (Gupta et al., 2016). However, it is lower than those from Jordan (Abu-Awwad et al., 2019). This might be due to a lack of familiarity with the SDA idea or the insufficiency of current evidence-based treatment techniques. Even systematic reviews found SDAs to be a promising treatment option in terms of functioning, patient satisfaction, improved oral hygiene, comfort and cost effectiveness; however, there have been no studies on the primary outcome of SDA, which could have made it less likely recommended treatment option (Armellini and von Fraunhofer, 2004; Khan et al., 2014).

Past reports showed that the specialists/consultants applied the concept of SDA very frequently than general dental practitioners. The SDA treatment modality was applied to less than 10% of Saudi Arabian patients (Vohra et al., 2016). Similar results were documented from the Indian study in which dental professionals with master's degrees applied SDA concept more often than bachelor's degree qualified dentists (Agrawal et al., 2020). Our study result is in accordance with the studies mentioned above. The probable explanation for such a finding could be that SDA is based on conservative treatment provision and the cost was shown to be the most critical factor in deciding on SDA therapy, which may have influenced the selection of SDA therapy.

In the subsequent analysis, differences across gender and designation were explored and findings reported significant gender differences. Male subjects compared to females agreed that there were no absolute contra indications to applying the SDA idea to patients. Similarly, females expressed more agreement than males about the dental arch shortening, with a significant difference. In line with our findings, studies have reported that a short dental arch could provide acceptable chewing function, oral comfort and aesthetic needs (Faharina et al., 2017).

The standard SDA, which consists of anterior teeth and four occlusal units, often four premolars, satisfies the needs of older persons with enough adaptive ability (Kayser et al., 1989). Evidence indicates that patients with SDA have an appropriate masticatory function, good occlusal stability, simplified oral hygiene maintenance, a better prognosis for the remaining teeth, fewer treatment costs and preservation of oral tissues (Sarita et al., 2003; Arigbede et al., 2009; Kumar and George, 2012; Gupta et al., 2016). However, knowledge related to several items of SDA was significantly higher among specialists/consultants than among GP. Although, no significant difference could be found in this study about gender and designation of the dental professionals and the SDA impact on chewing ability, TMJ health, appearance and oral comfort.

The SDA technique provides an option for less therapy that is less difficult, less time consuming and less costly (Omar et al., 2004) and it fits well in a global context characterized by a wide spread lack of dental and economic resources. The SDA idea seems to be generally recognized in several nations (Allen et al., 1996; Witter et al., 1997; Arigbede et al., 2009; Kasim et al., 2018), as well as among specialists/consultants (Witter et al., 1997). In light of the benefits of SDA concept, cost constraints and other restrictions, the teaching focus for situations with impaired dentition in the elderly should be switched toward the SDA. In addition, SDA principles must be promoted since they apply to many developing nations because it gives a functional approach at a lower cost (Swedan et al., 2017).

Self reported questionnaires and the relatively small number of participants compared to the overall certified dental practitioners from Saudi Arabia might restrict the generalizability of the study's findings. Therefore, additional research with a broad, representative sample from all administrative areas of Saudi Arabia is necessary.

#### 5. CONCLUSION

It can be concluded that most dental professionals were somewhat aware of SDA concept. Female study participants and specialists/consultants showed a higher level of awareness. However, their knowledge and attitude about SDA were less than adequate with gender and designation variations. Hence, the inclusion of SDA within the curriculum of under graduate and post graduate schools is essential.

#### Author contribution

Majed Bedah Al-Otaibi, Abdulmajeed Jamal H Alanazi and AnmarAbdulkhaliq O Alarnous, participated in protocol design, data collection, analyzed the data and the study. Ali Yahya Alfari, Faisal Mohammed Alzain, data collection, analyzed the data and the

study. Bader Soliman Alhussain analyzed the data and supervised the study. All authors reviewed and approved the final manuscript.

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### Ethical approval

The study was approved by Research and Innovation Center of Riyadh Elm University, Saudi Arabia (FRP/2021/365/561/536).

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### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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